NOTES

THE STATUS OF *CLARKIA MOSQUINII* (ONAGRACEAE).—L. D. Gottlieb, Section of Evolution & Ecology, University of California, Davis, CA 95616, and Lawrence Janeway, Herbarium, Department of Biological Sciences, California State University, Chico, CA 95929.

The species of *Clarkia* section *Myxocarpa* are closely similar morphologically and are often difficult to distinguish in the field. Geographical location is helpful with the six diploid species because they are distributed generally from north to south in northern California, from Shasta Lake to the central Sierra Nevada and, in any particular locality, one is unlikely to come upon more than two of them. However, the tetraploid *C. rhomboidea* ($n = 12$) is widely distributed throughout the same area and it may be confused with several of the diploids. The diploid species constitute an aneuploid series with the more northerly species *C. borealis, C. mildrediae* and *C. stellata* having $n = 7$, the centrally distributed *C. mosquinii* $n = 6$, and the species to the south *C. virgata* and *C. australis* $n = 5$.

The least known of the species in section *Myxocarpa* is *C. mosquinii* which was originally described as having two subspecies: subsp. *mosquinii* and subsp. *xerophila,* each from a single collection about 30 km apart in the Feather River region of Butte County (Small, Canadian Journal of Botany 49:1211–1217, 1971). The two subspecies were distinguished solely by a difference in leaf shape, with those of subsp. *mosquinii* said to be "elliptical to ovate" and those of subsp. *xerophila* "linear lanceolate" (Small, 1971). Because the type locality of subsp. *mosquinii* was not clearly identifiable from the type description (see below), and the type location of subsp. *xerophila* was inundated by the formation of Lake Oroville, it was not surprising that both taxa were listed as "Presumed Extinct" by Lewis (in Hickman, J. C., ed. The Jepson Manual, University of California Press, Berkeley, 1993).

Janeway (Madroño 40:268–269, 1993) reported a number of sites for subsp. *mosquinii* along Dark Canyon in Butte County, and three localities for subsp. *xerophila,* all in Butte County. Subsequent intensive field studies by Janeway (while in the employ of Plumas National Forest) located a number of additional sites. Janeway's identifications were based entirely on morphological characters of plants growing at the sites. Consequently, to validate his identifications, we grew out plants from seeds collected at many of his sites, and examined their morphology and counted root tip chromosomes. Our results confirm that *C. mosquinii* is extant, but show, in conjunction with a careful reading of Mosquin (Ph.D. dissertation, University of California, Los Angeles, 1961) that the taxonomic recognition of subspecies is not warranted.

Root tip chromosome counts from freshly germinated seedlings grown from seeds along French Creek Road off of Oroville-Quincy Highway (Gottlieb 9310), French Creek at Road 34 (Gottlieb 9312), and Ponderosa Dam on the South Fork Feather River (Janeway 4582), all initially classified as subsp. *xerophila,* revealed $2n = 12$. This distinctive chromosome number proves that *C. mosquinii* is extant and grows at several sites in the region. Flowering material from each of these sites is represented by Janeway 4410 (CHSC, DAV), 4414 (CHSC, LA), and 4386 (CHSC), respectively. The Ponderosa Dam site was one of those previously reported by Janeway (1993). A second site reported in Janeway (1993), north of the French Creek Road crossing of Peavine Creek, was also confirmed in the field by Janeway in 1993.

However, root tip chromosome counts from Dark Canyon Road (Gottlieb 9320),

and three other morphologically similar collections from Butte County, Feather River Canyon at Bear Ranch Creek (Gottlieb 9318, 9319), Oroville-Quincy Highway south of Junction House (Gottlieb 9315), and Swayne Hill (Gottlieb 9314), revealed $2n = 24$, indicating the plants were actually *C. rhomboidea,* and suggesting that collections cited in Janeway (1993) as subsp. *mosquinii* are *C. rhomboidea.* Flowering material from these latter three sites is represented by Janeway 4364 (CHSC, CAS), 4399 (CHSC, LA, DAV), and 4366 (CHSC, DAV), respectively. Further field studies by Janeway in 1994 (again in the employ of Plumas National Forest), plus a reexamination of the specimens cited in Janeway (1993) confirms that the plants there reported are all *C. rhomboidea.* Compared to *C. rhomboidea, C. mosquinii* has a larger and protandrous flower with a relatively long style extending beyond the anthers whereas in *C. rhombidea* the stigma and anthers are at the same height and mature at the same time. In addition, the stem of *C. mosquinii* is erect 3–4 nodes above the highest open flower. In *C. rhomboidea,* the stem is generally recurved just above the uppermost flower. Surprisingly, a small number of *C. mosquinii* plants were found at Dark Canyon in late June, 1994; they had not been seen previously because they flower about four weeks later than *C. rhomboidea.*

Plants now referrable to *C. mosquinii* were first collected by Mosquin (1961) as *C. virgata,* but with $n = 6$ rather than $n = 5$ characteristic of the more southerly *C. virgata.* Two collections were made and were described in his dissertation as follows: (1) Mosquin 3133 and 3335 from "Mayaro; 3.7 miles southwest of the entrance to Plumas National Forest, Plumas County," and (2) Mosquin 3336 from "Enterprise; 0.2 miles west of Enterprise along road to Oroville, Butte County."

Small (1971) designated Mosquin's collection 3335 as the type of *C. mosquinii* subsp. *mosquinii* and his own collection (Small 178) from the locality of Mosquin 3336 as the type of *C. mosquinii* subsp. *xerophila,* and noted that both taxa were known only from the type locations. His description of the type locality of subsp. *mosquinii* was that it was "along the California State Highway 40 Alternate, 3.7 miles southwest of entrance to Plumas National Forest." He did not include Mosquin's reference to Mayaro, a named site on Forest Service maps of the time, about 3 km northeast of Pulga on the Feather River Highway, now designated Highway 70, a lapse which proved unfortunate for later collectors. This was perhaps understandable since the specimen label did not include the reference to Mayaro. Thus, Janeway (1993) noted several unsuccessful searches by various botanists to relocate *C. mosquinii* subsp. *mosquinii,* and he presumed, in error, that the type locality was along Dark Canyon Road (formerly Highway 40 Alternate), which is indeed 3.7 miles (6 km) from the present Plumas National Forest entrance sign. However, the Mayaro site is about 13 km northeast of Dark Canyon, and also about 3 km northeast of Pulga which is cited in Lewis (1993) as the type location ("Feather River Canyon, near Pulga") of subsp. *mosquinii.* Mayaro and Pulga are both within what is commonly called the Feather River Canyon, but Dark Canyon is not.

Small (1971) distinguished the two subspecies of *C. mosquinii* only on the basis of presumed differences in leaf shape. Apparently he worked only from Mosquin's preserved material in describing subsp. *mosquinii,* and did not read Mosquin's dissertation which stated the variable nature of the character. "The two known populations of *C. virgata* ($n = 6$) are most variable with respect to leaf and petal shape. Most individuals of both populations have linear-lanceolate to lanceolate leaves, although other plants may have oblanceolate or ovate leaves" (Mosquin 1961, p. 14). Leaf shape was also variable on the plants we grew in the greenhouse.

We conclude that since the subspecies diagnosis depended only on differences in leaf shape and since this character is variable, there is no taxonomic basis to maintain subspecies within *Clarkia mosquinii.* The geographical distribution of *C. mosquinii,* as presently understood, includes the region between Mosquin's Mayaro site, near Pulga on the North Fork of the Feather River, south to Ponderosa Dam on the South Fork of the Feather River, a distance of about 30 km. Rediscovery of *C. mosquinii* is important because it provides a geographic and a phylogenetic link between the

northern species in section *Myxocarpa* with $n = 7$ and the southern species with $n = 5$.

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CUSHION-LIKE FRUTICOSE LICHENS AS *DUDLEYA* SEED TRAPS AND NURSERIES IN COASTAL COMMUNITIES.—Richard E. Riefner, Jr. and Peter A. Bowler, Museum of Systematic Biology and Department of Ecology and Evolutionary Biology, University of California, Irvine 92717.

The species-rich lichen communities of the coastal bluffs and cliffs in California and Baja California, Mexico, are able to survive because of the ability of lichens to readily absorb moisture from coastal fog. Similar situations are found in the diverse lichen floras of maritime zones in many other regions experiencing a Mediterranean climate (Nash et al., Madroño, 26:149–163, 1979). The often dense growth of fruticose lichens, particularly saxicolous *Niebla* species (Ramalinaceae), provides an interesting and unique micro-habitat. *Niebla ceruchoides* is a well known, easily recognized coastal saxicolous lichen occurring from northern Baja California, Mexico, to the San Francisco Bay region in northern California (Bowler et al., Phytologia 77:23–37, 1994). This species is identified readily by either its cushion-like fruticose thallus 1–2 cm high or a larger 3–4 cm high more open bush-like morphology. The cushion-like lichen mats resemble miniature wind-trimmed coastal sage scrub vascular plants, and the lichens are similarly sculpted to some extent by their exposure to wind and fog along the coastal rocks and cliffs. Both growth forms are gregarious and are characterized by dichotomously branched, terete laciniae that rarely exceed 1 mm in cross-section. *Niebla ceruchoides* is especially abundant in summer fog zones from Punta Banda to Morro Bay.

During an ongoing investigation of the relict endemic vegetation of summer fog zone habitats in the California Floristic Province by the senior author, observations of micro-habitats in which several *Dudleya* species occur indicate that an interesting association exists between a number of coastal, cliff-dwelling *Dudleya* taxa and *N. ceruchoides*. Apparently the dense, intricately branched thallus of this lichen effectively captures minute *Dudleya* seeds as they are dispersed in their seasonal seed rain across rock outcrops. The lichen cushion provides a foothold for the seedlings and possibly an enriched nutrient seed bed that encourages propagation of *Dudleya* seedlings on otherwise sheer rock. The resulting consolidation of soil allows additional humus accumulation and further plant colonization. The expanding *Dudleya* caudex fragments the lichen thallus and enhances dispersal of the lichen. This process is mutually beneficial by making additional lichen cushions available for colonization by *Dudleya*. Seed capture by the thallus may decrease the fortuitous dispersal of *Dudleya* seeds to unfavorable habitats, possibly contributing to the viability of several locally endemic *Dudleya* taxa. Other possible ways in which the micro-bushes of lichen could increase germination and recruitment success of *Dudleya* species include greatly increasing the presence of water available to the seedling due to fog capture (lichens are known to rapidly absorb moisture equal to 150%–1200% of their dry weight; Hawksworth and Hill, The Lichen-forming Fungi, 1984), and the protection of young plants from snail and slug herbivory. The cushions of lichen are particularly well suited for trapping soil particles that build a suitable substrate for vascular plant growth.

Large, reproductively viable populations of *D. stolonifera* in Orange County, *D. verityi* in Ventura County, *D. caespitosa* in San Luis Obispo County, and *D. anomala* and *D. campanulata* in Baja California Norte are consistently associated with exten-